Where the LASER

Meets the Road

Digital Scanning Brings New Precision to Pavement Reporting

After generations of estimating pavement conditions from visual inspections, Caltrans is adopting cutting-edge technology that will give it the most complete and accurate picture of California's highways that it has ever had.

Caltrans is creating a pavement management system that could reduce the cost to design and maintain the state's highways using a combination of radar, lasers and automated pavement scanning machines, as well as advanced computer modeling.

Until recently, Caltrans engineers assessed the condition of the state highway's pavement by visual surveys. The department has added ground-penetrating radar images that show engineers what is beneath the surface and is using laser technology to scan every inch of the system, including GPS coordinates for every pothole and crack.

PaveM Technology Tour

In this video, Supervising Caltrans Transportation Engineer Tom Pyle explains the difference in how the department used to collect pavement data and the way it now collects it with the automated survey. He also shows some of the information available with PaveM that Caltrans can use to better maintain the state's pavement.

In years past, crews of six would drive every highway and freeway in the state, stopping every mile to examine a 100-foot section. From their observations of that section they would predict the condition of the entire mile. From those approximations—the best that was available for decades—Caltrans compiled the annual State of the Pavement Report.

That report informs the public of the condition of the state's roads and lays out the resources required to maintain the system. With the more complete picture becoming available from its new high-tech programs, Caltrans will be able to predict resource needs more accurately and precisely.

Instead of six-person crews, Caltrans now deploys specially equipped vehicles that travel at normal highway speeds, gathering high-definition images of the road surface using lasers and noting the GPS location, depth and width of each crack, rut and bump along the way.

Recently, Caltrans literally looked deeper at wear and tear on pavement. In specially equipped vehicles much like those used for the pavement survey, ground-penetrating radar mapped the entire subsurface of the state highway system. It's like an X-ray of the road. This was the largest ground-penetrating radar pavement survey in the world.

This underground radar mapping adds a new dimension to pavement maintenance planning for Caltrans. Before, if Caltrans wanted an idea of what lay beneath the surface, it had to shut down a lane of roadway and take an expensive core sample. Now, by knowing the road's composition, not only on top but beneath, Caltrans can better predict how that stretch of road will wear over time and can make better decision about where to use maintenance dollars.

Caltrans is developing a new way to monitor roads and aid engineers in selecting projects using the Pavement Management System (PaveM). Caltrans will combine data from both the pavement survey and the ground-penetrating radar survey to create models that include all the factors that can contribute to pavement's wear and tear—from the road's composition, to climate, to traffic flows, to the composition of the ground underneath the roadbed. All this information allows Caltrans engineers to create better predictions of when roads will require maintenance work and make recommendations about the most cost-effective treatments.

Addressing pavement needs early costs about an eighth of what it costs to do major rehabilitative work on a road, and PaveM will help Caltrans better invest taxpayer dollars by helping the department better identify pavement needs.

Source: Division of Maintenance,
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